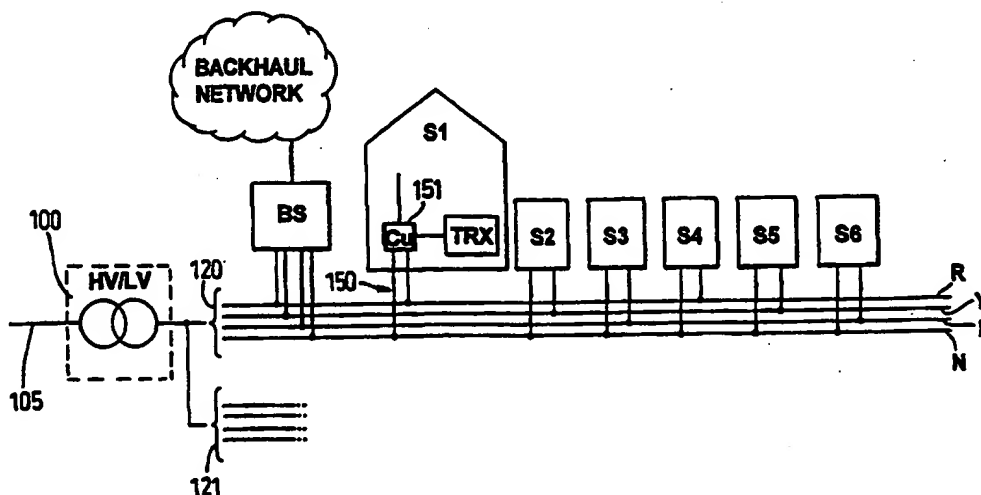




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08/871,930 10 June 1997 (10.06.97) US 9714659.1 11 July 1997 (11.07.97) GB 9805765.6 17 March 1998 (17.03.98) GB			
(71) Applicant (for all designated States except US): NORTHERN TELECOM LIMITED [CA/CA]; World Trade Center of Montreal, 8th floor, 380 St. Antoine Street West, Montreal, Quebec H2Y 3Y4 (CA).			
(72) Inventors; and		Published	
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		(88) Date of publication of the international search report: 11 November 1999 (11.11.99)	

(54) Title: DATA TRANSMISSION OVER A POWER LINE COMMUNICATIONS SYSTEM



(57) Abstract

A power line communications system comprises a power line (120) for distributing electricity to a plurality of premises (S1, S2...) and communication stations (TRX) coupled to the power line at the premises. Data is transmitted to/from stations over the power line using a packet data communications protocol. Apparatus at premises can convert signals between a first protocol, used on the power line, and a second protocol e.g. Ethernet for transferring data to a communications station.

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INTERNATIONAL SEARCH REPORT

national Application No
PCT/GB 98/01667

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04B3/54

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 715 045 A (LEWIS KENNETH A ET AL) 22 December 1987 (1987-12-22)	1,5-7, 10-12
Y	column 10, line 56 - line 66; figure 4 figure 3 claim 1	2-4,8,9, 13-18
Y	WO 95 19070 A (ELCOM TECHNOLOGIES CORP ;ABRAHAM CHARLES (US)) 13 July 1995 (1995-07-13) page 15, line 7 - line 14 page 17, line 4 - line 24 -/--	2-4, 13-18

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

13 August 1999

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 245 633 A (MULLER MARC ET AL) 14 September 1993 (1993-09-14) abstract column 8, line 55 - line 63 column 9, line 23 - line 27 column 1, line 13 - line 20 ---	8,9
A	WO 95 29537 A (NORWEB PLC ;BROWN PAUL ANTHONY (GB)) 2 November 1995 (1995-11-02) page 3, line 16 - line 26 ---	1-22
X	WO 94 03002 A (COMSOURCE SYSTEMS CORP ;HILL LAWRENCE WOODBRIDGE (US)) 3 February 1994 (1994-02-03) abstract	23,24, 30-32
A	page 5, line 12 - line 16 page 6, line 12 - line 19 page 8, line 1 - line 11 ---	59-64
X	EP 0 397 535 A (CODEX CORP) 14 November 1990 (1990-11-14)	23,24, 30-33
A	abstract page 3, line 17 - line 49 ---	59-64
A	WO 96 31009 A (CELSAT AMERICA INC) 3 October 1996 (1996-10-03) page 7, line 18 - page 8, line 2 -----	30-32

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 98/01667

3

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
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2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☒ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

23-33, 59-64

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 98/01667

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-22

Power line communication apparatus which uses a first data packet protocol to carry the transmission on the power line and a second data packet protocol to carry the transmission on the local area network.

2. Claims: 23-33,59-64

Power line transmission apparatus for transmitting data at a certain bit rate which is derived by the channel performances.

3. Claims: 34-38

A method of transmitting data on the power line communications system wherein the data packets are carried in different bands

4. Claims: 34,39-40

A method of transmitting data on the power line communications system by determining a quiet period when noise upon the power line is at a reduced level

5. Claims: 34,41-58

A method of transmitting data on the power line communications system wherein the data packet communications protocol is polling or CSMA or token bus

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/01667

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4715045 A	22-12-1987	US 4577333 A EP 0174612 A JP 61084143 A	18-03-1986 19-03-1986 28-04-1986
WO 9519070 A	13-07-1995	AU 705571 B AU 1563195 A CA 2181041 A EP 0744100 A US 5592482 A US 5625863 A	27-05-1999 01-08-1995 13-07-1995 27-11-1996 07-01-1997 29-04-1997
US 5245633 A	14-09-1993	FR 2674390 A AT 151213 T DE 69218652 D DE 69218652 T EP 0505223 A ES 2099803 T	25-09-1992 15-04-1997 07-05-1997 10-07-1997 23-09-1992 01-06-1997
WO 9529537 A	02-11-1995	AU 1638999 A AU 704011 B AU 2262795 A BG 106994 A BR 9507402 A CA 2188271 A CZ 9603058 A EP 0756786 A EP 0913955 A FI 964232 A GB 2302783 A,B GB 2330049 A,B HU 76007 A JP 9512394 T NO 964432 A NZ 284119 A PL 316982 A	29-04-1999 01-04-1999 16-11-1995 28-11-1997 07-10-1997 02-11-1995 11-06-1997 05-02-1997 06-05-1999 21-10-1996 29-01-1997 07-04-1999 30-06-1997 09-12-1997 04-12-1996 27-04-1998 03-03-1997
WO 9403002 A	03-02-1994	US 5448593 A AU 4781393 A EP 0651925 A	05-09-1995 14-02-1994 10-05-1995
EP 0397535 A	14-11-1990	US 5048054 A AT 148969 T CA 2012913 A DE 69029914 D DE 69029914 T DK 397535 T ES 2100163 T GR 3023410 T HK 1004586 A JP 2309736 A SG 49716 A	10-09-1991 15-02-1997 12-11-1990 27-03-1997 21-08-1997 18-08-1997 16-06-1997 29-08-1997 27-11-1998 25-12-1990 15-06-1998
WO 9631009 A	03-10-1996	EP 0801850 A	22-10-1997

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